

Claims

1. A communication apparatus comprising:
 - a transmission modulator for impulse-modulating transmission data and generating subcarriers;
 - a carrier control section for controlling the subcarriers for use in communication depending upon information amount, significance and communication propagation condition; and
 - an antenna section for radiating the subcarrier signals.
2. A communication apparatus according to claim 1, further comprising a reception modulator for detecting reception data and examining a reception power on each subcarrier,
 - to notify to the subcarrier control section a permission/non-permission to use the subcarrier, depending upon the reception power examined by the reception demodulator.
3. A communication apparatus according to claim 2, wherein the carrier control section causes hopping two or more of the subcarriers.
4. A communication apparatus according to claim 2, wherein the carrier control section causes spread on two or more of the subcarriers.
5. A communication apparatus according to claim 2, wherein the transmission modulator changes an on-frequency allocation of the subcarriers according to communication condition.
6. A communication apparatus according to claim 2, wherein the transmission modulator assigns a narrower band to the subcarrier having a lower center frequency and a broader band to the subcarrier having a higher center frequency.
7. A communication apparatus according to claim 2, further

comprising a channel control section for selecting and controlling the subcarrier for use on each channel,

the channel control section performing communication over two or more channels with different ones of the subcarriers.

8. A communication apparatus according to claim 7, wherein the channel control section performs communication over two or more channels with a combination of different ones of the subcarriers.

9. A communication apparatus according to claim 7, wherein carrier control section performs communication of control information by at least one of the subcarriers.

10. A communication apparatus according to claim 9, wherein the transmission modulator multiplexes together the pieces of control information on two or more channels by use of any one of time division multiplexing and code division multiplexing, in at least one subcarrier of two or more of the subcarriers.

11. A communication apparatus according to claim 2, wherein the transmission modulator carries out frequency division duplex by use of two or more of the subcarriers.

12. A communication apparatus according to claim 9, wherein the transmission modulator carries out frequency division duplex by use of three or more of the subcarriers.

13. A communication apparatus according to claim 9, wherein the subcarrier with which the transmission modulator is to communicate the control information has a center frequency lower than a center frequency of the other subcarrier.

14. A communication apparatus according to claim 9, wherein the subcarrier with which the transmission modulator is to communicate the control information has a band narrower than

a band of the other subcarrier.

15. A communication apparatus according to claim 7, wherein the transmission modulator divides one symbol into two or more of the subcarriers, thereby multiplexing two or more channels.

16. A communication apparatus according to claim 15, wherein the transmission modulator causes frequency hopping in one symbol by use of two or more of the subcarriers, to thereby multiplexing two or more channels.

17. A communication apparatus according to claim 15, wherein the transmission modulator causes encoding spread of one symbol onto two or more of the subcarriers, to thereby multiplexing two or more channels.

18. A communication apparatus according to claim 15, wherein the transmission modulator causes spread of one symbol onto two or more of the subcarriers and two or more chips, thereby multiplexing two or more channels.

19. A communication apparatus according to claim 2, wherein the antenna section comprises a plurality of antenna elements.

20. A communication apparatus according to claim 2, wherein the antenna section has a frequency characteristic of a multi-band characteristic.

21. A communication apparatus according to claim 19, wherein the antenna elements are different in center frequency of frequency characteristic.

22. A communication apparatus according to claim 21, wherein the antenna elements have band characteristics not to overlap on a frequency axis.

23. A communication apparatus according to claim 2, wherein the antenna section receives radio wave on a

subcarrier-by-subcarrier basis and outputs the subcarrier signal to the reception modulator.

24. A communication apparatus according to claim 19, wherein the antenna elements have frequency characteristics corresponding to the subcarriers and radiate subcarrier transmission signal as a radio wave.

25. A communication apparatus according to claim 2, wherein the reception demodulator has a compensation section for detecting a characteristic of a signal sequence of each subcarrier from a known signal received from a communication partner and compensating for the characteristic.

26. A communication apparatus according to claim 25, wherein the characteristic is a frequency characteristic.

27. A communication apparatus according to claim 25, wherein the characteristic is a time response characteristic, the compensation section compensating for the time response characteristic by a correlation signal of a correlator.

28. A communication apparatus according to claim 2, wherein the reception demodulator comprises

a spread code storing section for storing a spread code and extracting a spread code corresponding to the subcarrier, and

a disspread section for making a convolution operation of the subcarrier signal and the spread code extracted at the spread code storing section.

29. A communication apparatus according to claim 2, wherein the transmission demodulator comprises

a spread code storing section for storing a spread code and extracting a spread code corresponding to the subcarrier,

and

a spread section for making a direct spread onto the subcarrier from the modulation signal divided into the subcarriers and the spread code extracted at the spread code storing section.

30. A communication apparatus according to claim 2, wherein the reception demodulator comprises

a switch section for switching over by frequency hopping on the subcarrier,

the carrier control section carrying out the control in the switch section.

31. A communication apparatus according to claim 2, wherein the transmission demodulator comprises

a switch section for switching over by frequency hopping on the subcarrier,

the carrier control section carrying out the control in the switch section.

32. A communication method for impulse modulation communication with using a plurality of subcarriers, the communication method comprising:

a step of measuring a reception power on every subcarrier in a non-signal state, in an initial state prior to starting a communication; and

a step of determining the reception power measured and selecting the subcarrier usable in communication.

33. A communication method according to claim 32, wherein the determination is to use, in a later communication, the subcarrier having the reception power equal to or smaller than a predetermined value.

34. A communication method according to claim 33, further comprising

a step of measuring a reception power on every subcarrier of a received known signal at a start of communication; and

a step of selecting the subcarrier having the measured reception power equal to or greater than a predetermined value, as a subcarrier usable in communication.